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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,301	09/26/2003	Masaki Mizutani	03500.017597.	5357

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1722

DATE MAILED: 01/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/670,301

Applicant(s)

MIZUTANI ET AL.

Examiner

Matthew J. Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 1-6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>12/16/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group II, claims 7-13 in the reply filed on 10/20/2005 is acknowledged. The traversal is on the ground(s) that there would be no undue burden is search both groups together since the two group are not so different from each other. This is not found persuasive because a serious burden exists in the differing issues likely to arise during the prosecution of the different statutory classes of invention.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 1-6 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 10/20/2005.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 7-8 and 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Kiyota (JP 58-201377), an English Abstract has been provided.

Kiyota discloses a silicon substrate with grooves having a reversely trapezoid type section, where the trapezoid shape reads on applicant's inclined plane and the openings are narrowed due to the presence of the reverse trapezoidal shape since the opening at the bottom of the groove is large than the open near the top of the groove. (Abstract and Fig 3a-d).

Referring to claim 12, Kiyota discloses a solar battery element, this reads on applicant's solar cell, and forming a P-N junction (Abstract).

Referring to claim 13, Kiyota discloses an electrode 5 crossing over the grooves (Fig 3d).

5. Claims 7-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishida (US 5,254,481).

In a method of manufacturing a solar cell, note entire reference, Nishida discloses a (100) silicon wafer surface **201** having angular silicon single crystals arranged regularly at intervals of 50 μm (col 3, ln 1-67 and col 4, ln 35-68). The angular silicon single crystals **203** formed on the substrate have a inclined plane, note Fig 1D, and there is a gap between the silicon single crystals **203**, which are in communication with the inclined surface.

Referring to claim 8, the silicon single crystals **203** read on applicant's protusions which narrow the openings of the grooves, note fig 1D.

Referring to claim 9, Nishida et al discloses a (100) surface.

Referring to claim 10, Nishida et al disclose a width of 50 μm .

6. Claims 7-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakagawa et al (US 2002/0092464A1).

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In a method of liquid phase growth, note entire reference, Nakagawa et al discloses a (111) plane silicon wafer is heated to 955°C and a melt is cooled at a rate of 1°C/minute and the substrate is immersed in the melt when the melt is at a temperature of 950°C. Nakagawa et al also discloses growth is carried out for 30 minutes. ([0102]-[0103]). Nakagawa et al also teaches forming a solar cells and P-type and N-type layers ([0105]-[0106]). Nakagawa et al discloses a method of froming solar cells, note Example 3.

Nakagawa et al does not teach forming a plurality of gap portions communicated with an inclined plane. However, this feature is inherent because Nakagawa et al teaches a similar method of growth used by applicant's to obtain the claimed structure. Applicant's teach a method for obtaining the structure includes decreasing the temperature of the system at a constant rate with a decreasing rate of 0.2-2°C/minute and a growth time of 30-120 minutes, note page 6-7 of the instant specification. Nakagawa et al teaches a method of growth using a decreasing rate of 1°C/min for 30 minutes; therefore Nakagawa et al inherently forms the claimed structure because applicant's teach this method is used to obtain the claimed structure.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

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claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 7-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibuya (JP 62-101084), an English Abstract has been provided.

Shibuya discloses spherical spaces 6 are formed near the surface of a PN semiconductor 1 of a solar battery and a PN junction 2 is provided along those spheres. Electrodes 3 are provided on the top and bottom part of the semiconductor (Abstract and Fig 1). The spherical spaces read on applicant's substrate comprising an inclined plane because there are curves which are inclined in the spherical shape of the groove.

Shibuya does not teach a semiconductor substrate composed of silicon. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Shibuya by using a silicon substrate because silicon having a (100) orientation is well known in the art to be a conventional material for substrates used in the manufacturing of solar cells, as evidenced by Kiyota (JP 58-201377) above. The selection of a known material based on its suitability for its intended purpose is held to be obvious (MPEP 2144.07).

Referring to claim 8, the upper portions of the spherical space reads on applicant's protrusions because the portions narrow the opening of the space.

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Referring to claim 9, Shibuya does not teach the claimed orientation. A (100) orientation silicon substrate is well known in the art and is a conventional orientation for the manufacturing of solar cells, as evidenced by Kiyota (JP 58-201377) above.

Referring to claim 10-11, Shibuya the claimed width or depth. The Changes in size are obvious.

Referring to claim 12, Shibuya discloses forming a PN junction 2.

Referring to claim 13, Shibuya discloses an electrode 3 crossing over the plural grooves, this reads on applicant's collector electrode.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakagawa et al (US 2002/0092464A1) as applied to claims 7-12 above, and further in view of Kiyota (JP 58-201377), an English Abstract has been provided.

Nakagawa et al discloses all of the limitations of claim 13, as discussed previously, except a collector electrode crossing over the plural grooves on the semiconductor substrate.

Kiyota teaches a silicon substrate with grooves having a reversely trapezoid type section, where the trapezoid shape reads on applicant's inclined plane and the openings are narrowed due to the presence of the reverse trapezoidal shape since the opening at the bottom of the groove is large than the open near the top of the groove. (Abstract and Fig 3a-d). Kiyota teaches an electrode 5 crossing over the grooves (Fig 3d).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Nakagawa et al by forming an electrode, as taught by Kiyota to form a useful solar battery element.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJS
January 5, 2006

Matthew J Song
Examiner
Art Unit 1722


ROBERT KUNEMUND
PRIMARY EXAMINER